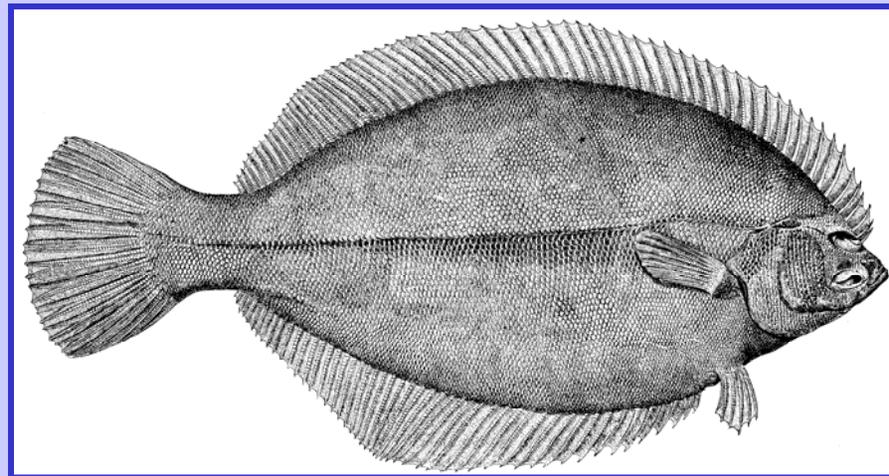
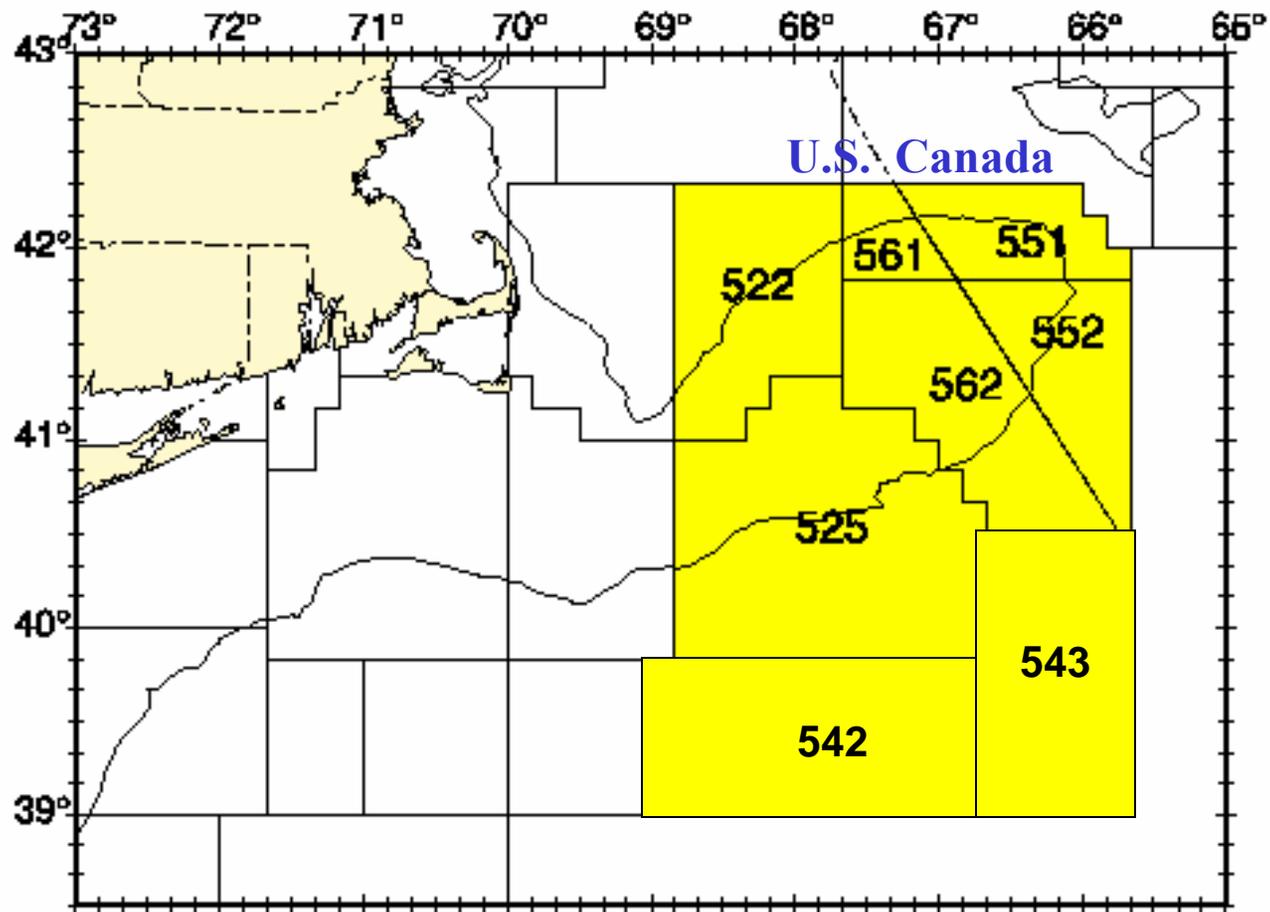


Draft Presentation
For Peer Review Only.
Does not represent
final NOAA Decision/Policy.
5/2/08

WP 4.K

Georges Bank Winter Flounder





GB winter flounder stock area

VPA Input Data

1982-2006

1. Catch-at-age (ages 1-7+)

Initial U.S. discard estimates and U.S. and CA landings

2. Tuning indices

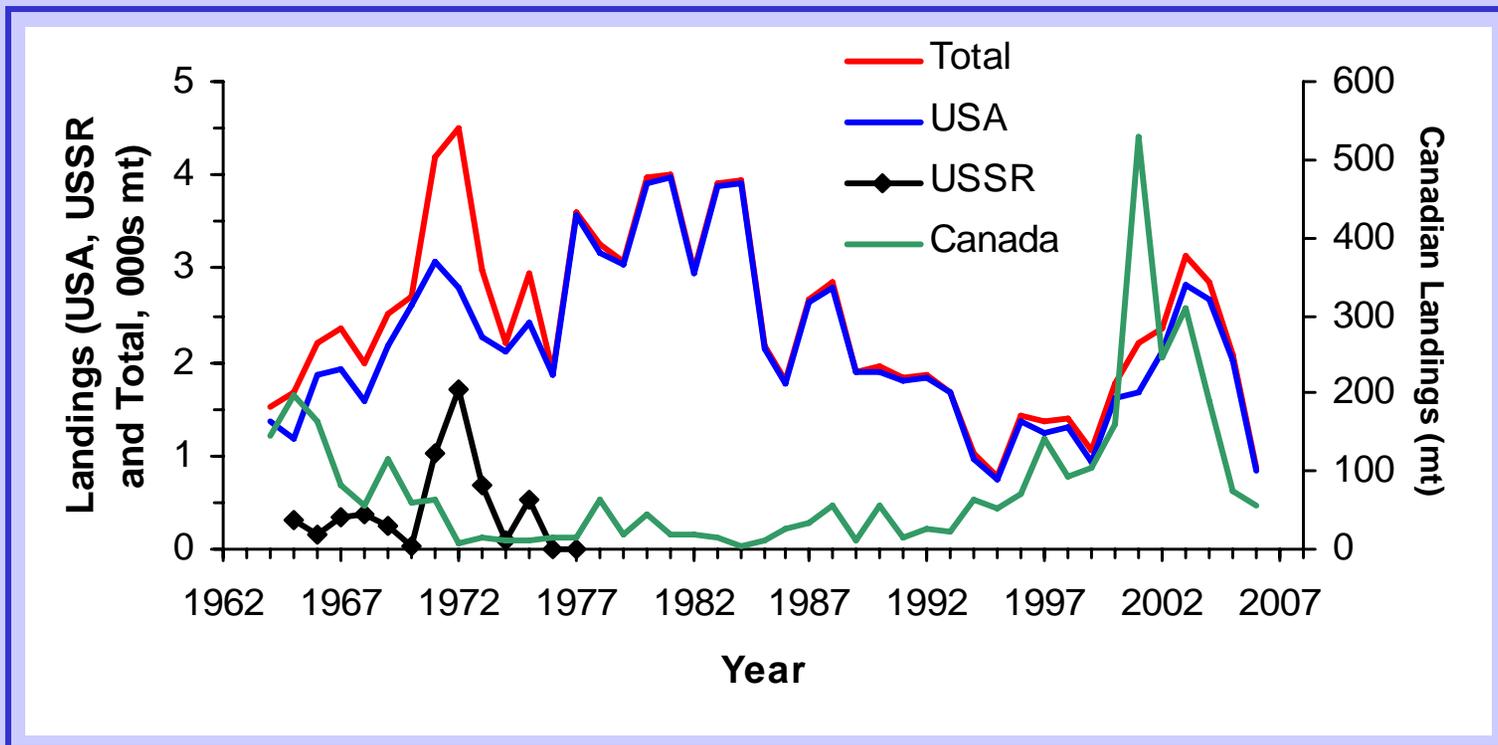
- **NEFSC fall survey (1981-2006, ages 0-7, lagged forward 1 yr and age)**
- **NEFSC spring survey (1982-2006, ages 1-7)**
- **CA spring survey (1987-2006, ages 1-7, NEFSC spr A/L)**

3. Maturity-at-age matrix (5-yr moving window)

4. **PR (0.0005, 0.1, 0.49, 1, 1, 1)**

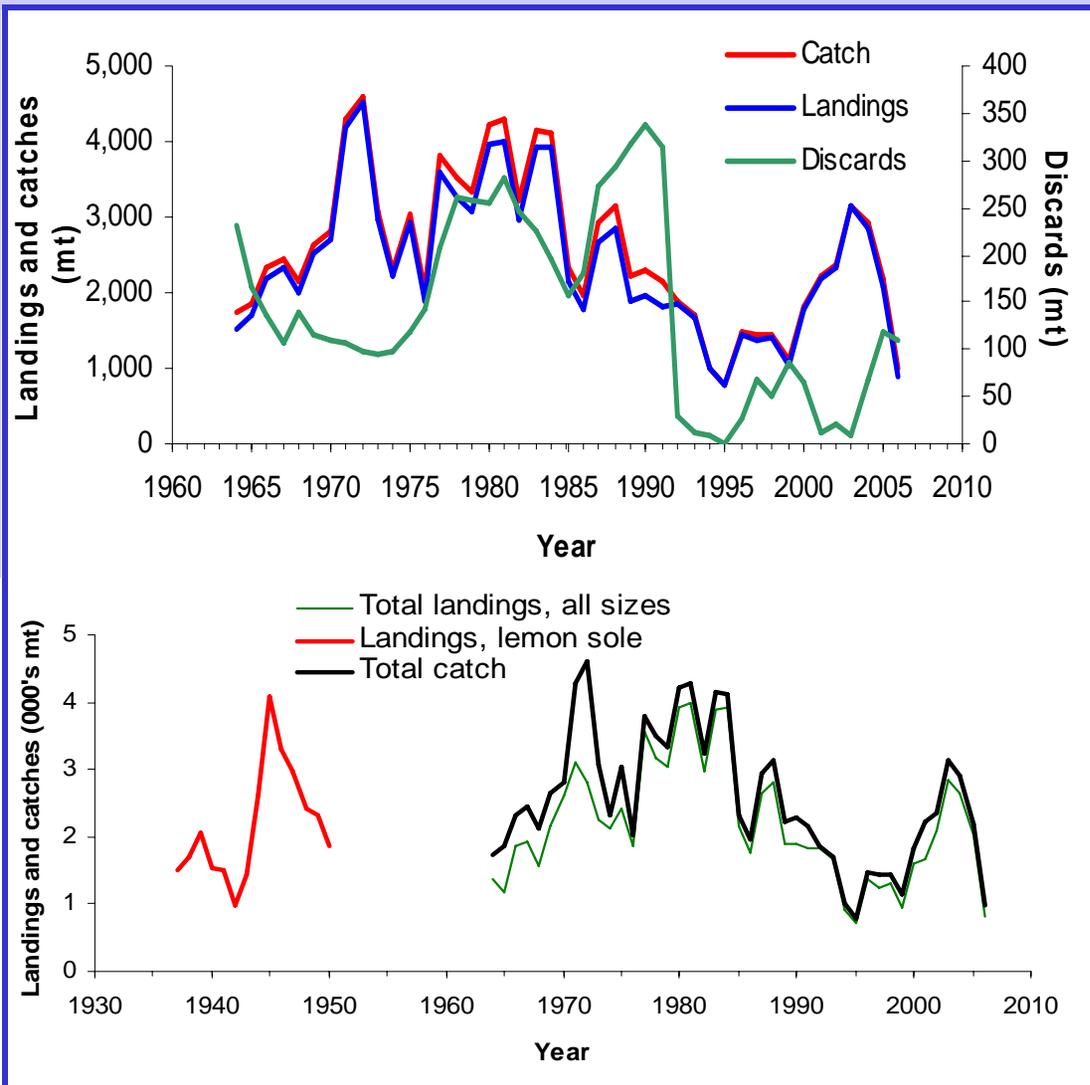
5. **M = 0.2**

Landings



- Small amt. landings from Russia (1965-1977)
- CA landings at peak in 2001 = 24% of total and were 4-7% during 2004-2006

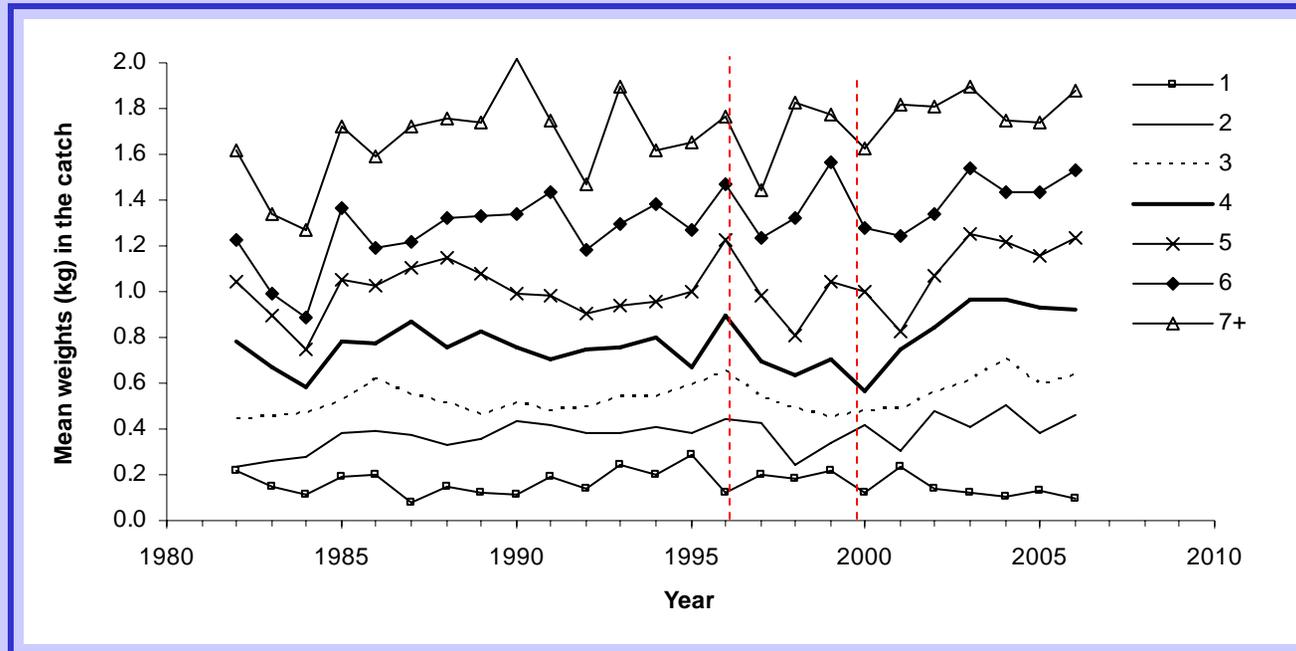
Catch



- Discards 1-15% of annual catch
- Catches were 1,700-4,600 mt during 1964-1984, then declined to 800 mt in 1995
- Catches increased to 3,100 mt in 2003 then declined to 1,000 mt in 2006

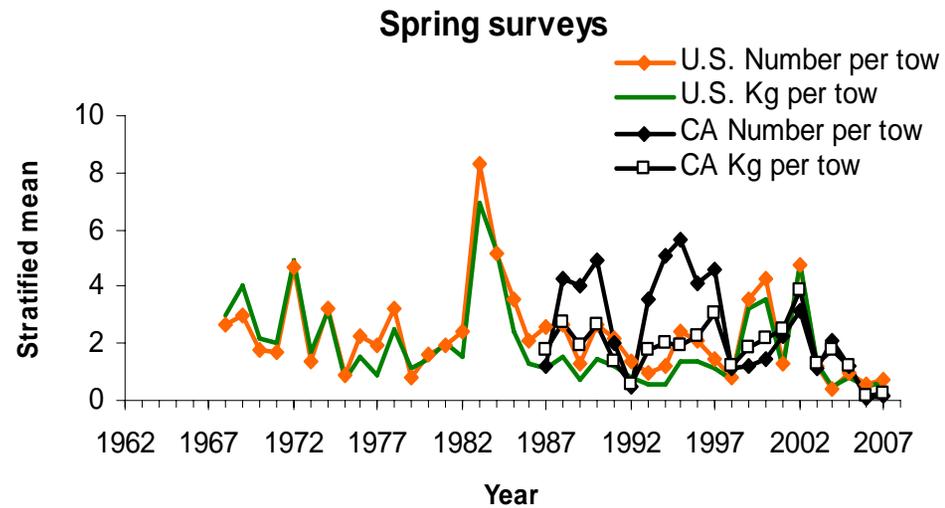
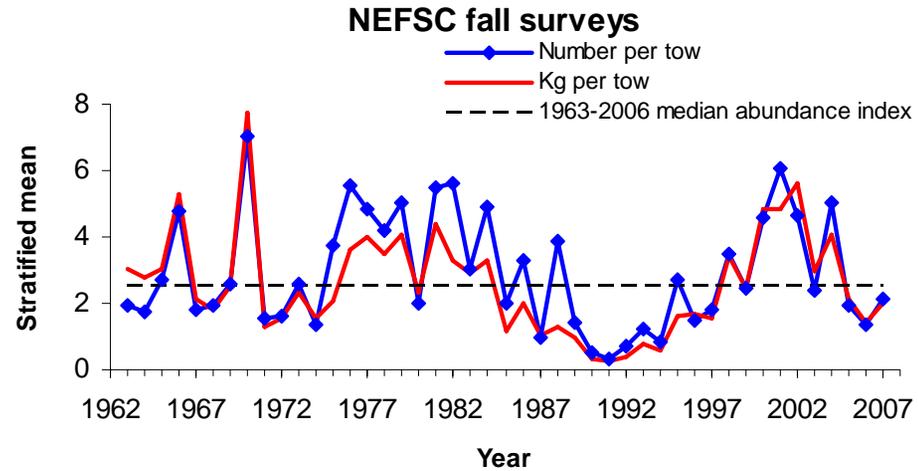
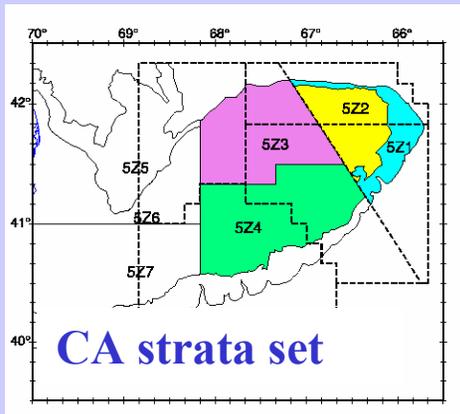
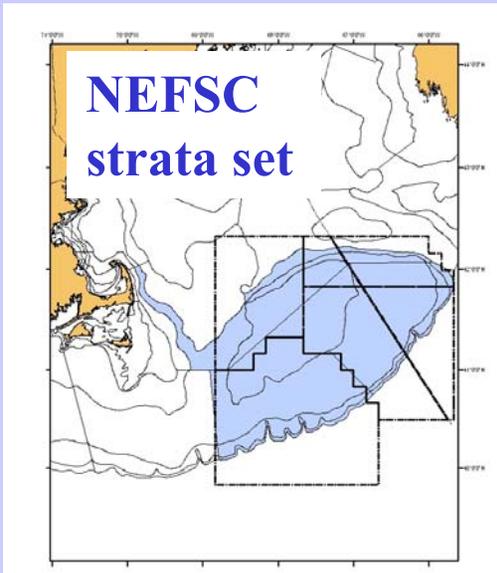
- Historical landings (1937-1950) likely much higher than landings since 1963, because largest mkt category alone peaked at 4,100 mt in 1945 (vs. 4,600 mt of catch in 1972)

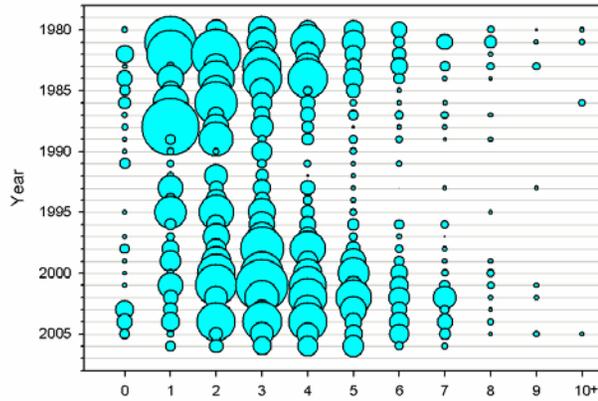
Catch mean weights-at-age, 1-7+



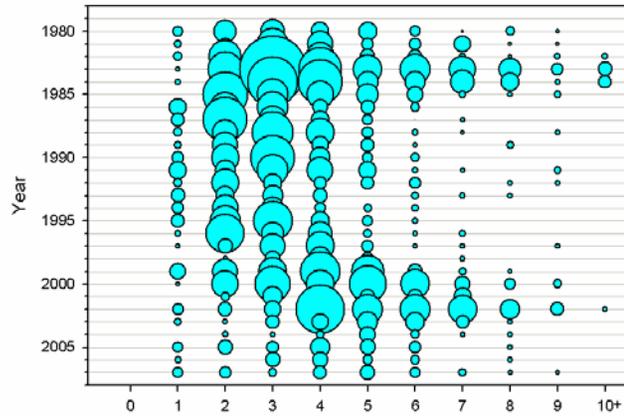
- Fairly stable during 1982-1996 then decl. through 1998 for ages 3-5 and more variable for older ages (poor sampling)
- Increasing since 2000/2001 for all ages except age 1

Survey Tuning Indices

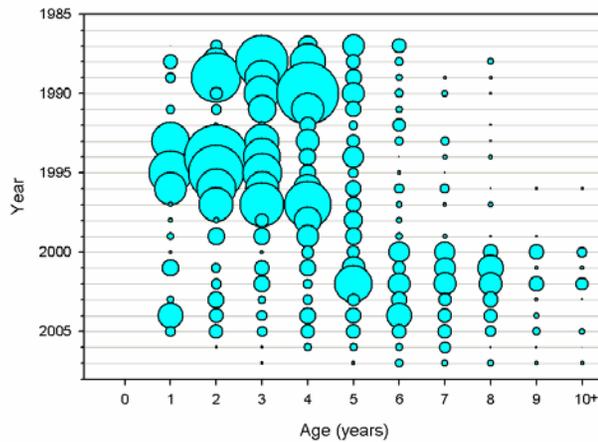




NEFSC fall



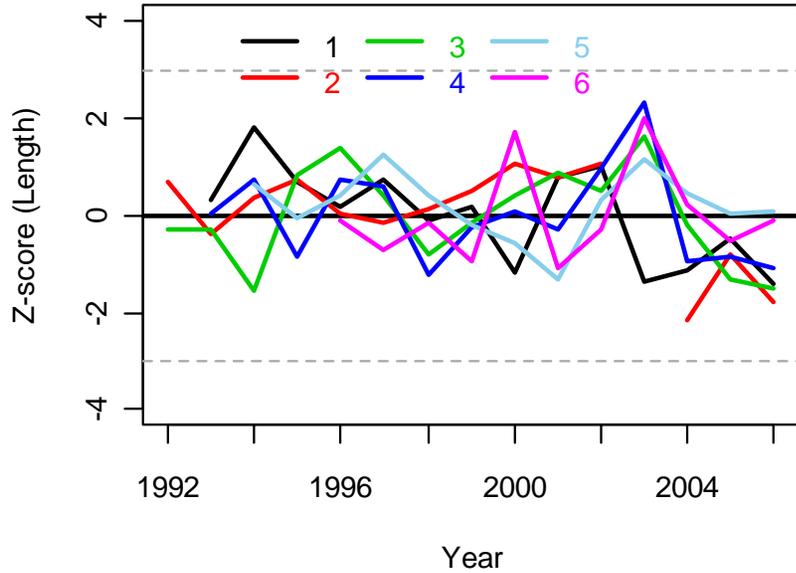
NEFSC spring



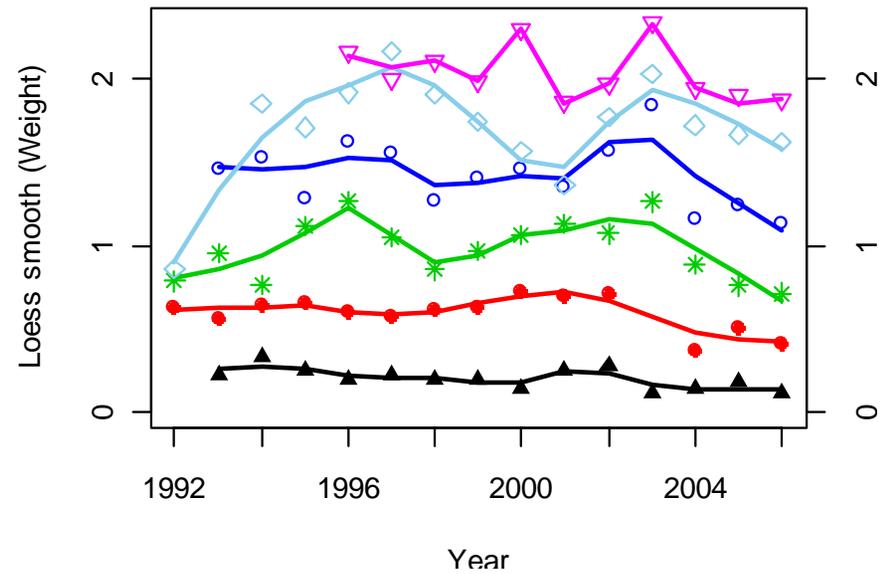
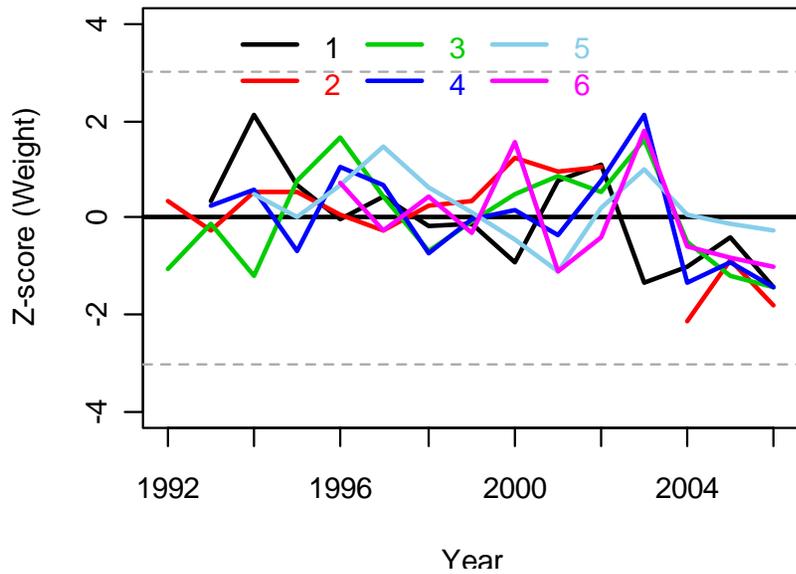
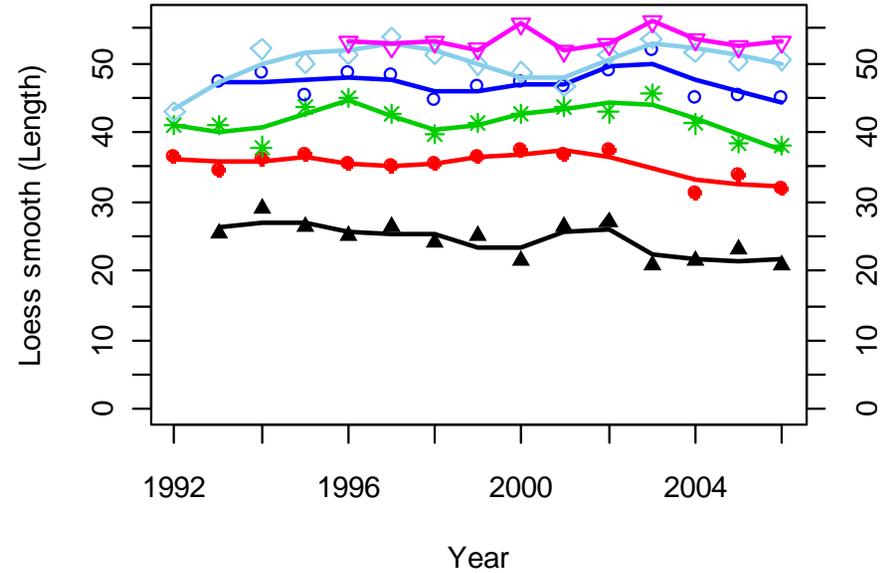
CA spring

Recent declines in mean length and weight

GB Female Winter Fldr Autumn Z-scores

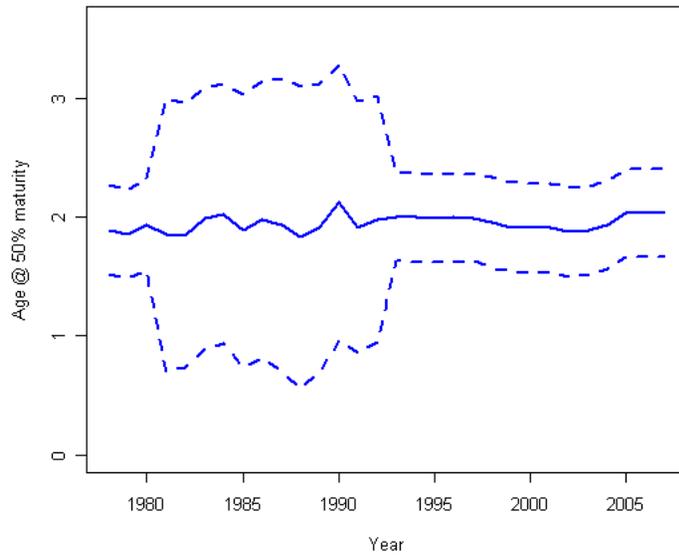


GB Female Winter Fldr Autumn Loess

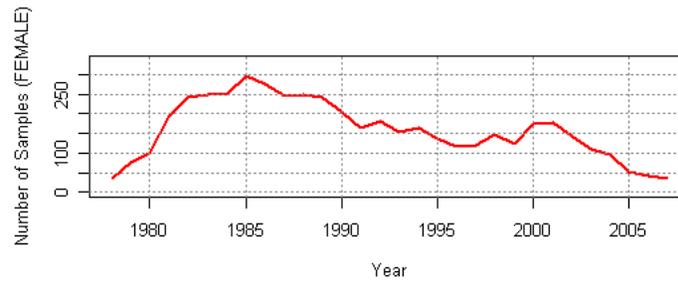
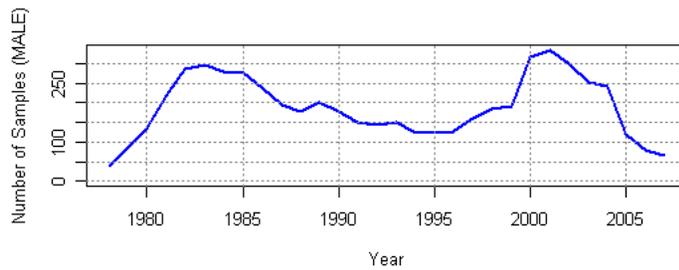


$A_{50} = \text{age } 2$ (5 yr moving window)

MALE Winter Flounder at 50% maturity (5 yr window)



FEMALE Winter Flounder at 50% maturity (5 yr window)



VPA results

Avg. F

0.65-1.32 (1984-1993)

0.38-0.64 (1994-1998)

0.32-0.97 (2000-2003)

declined to 0.27 in 2006

SSB

15,600-3,300 mt (1982-1994)

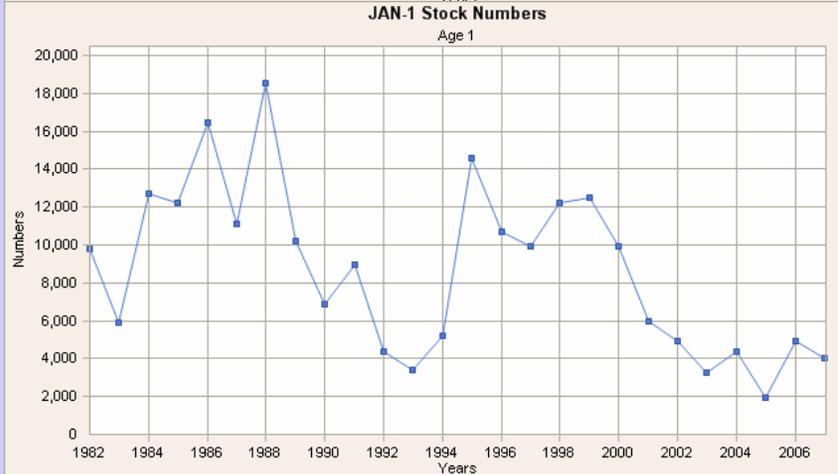
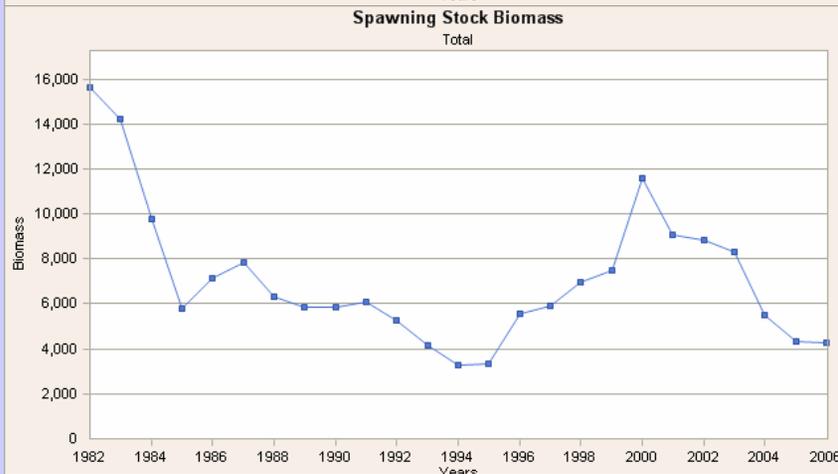
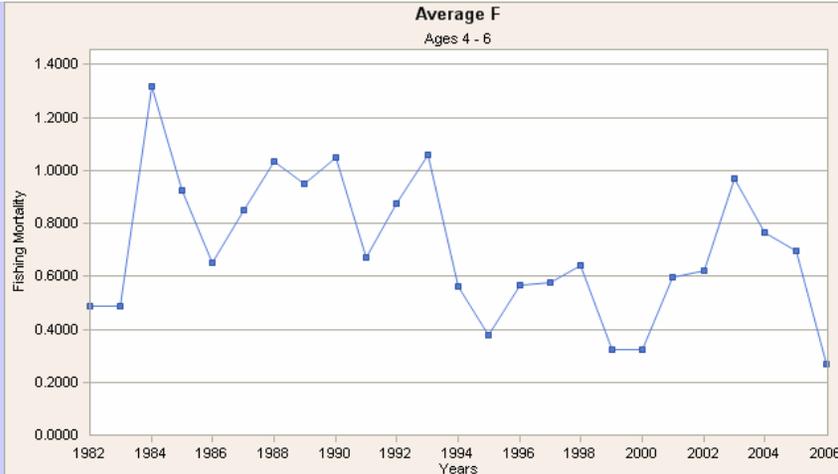
Increased to 11,600 mt in 2000 then declined to 4,300 mt in 2006

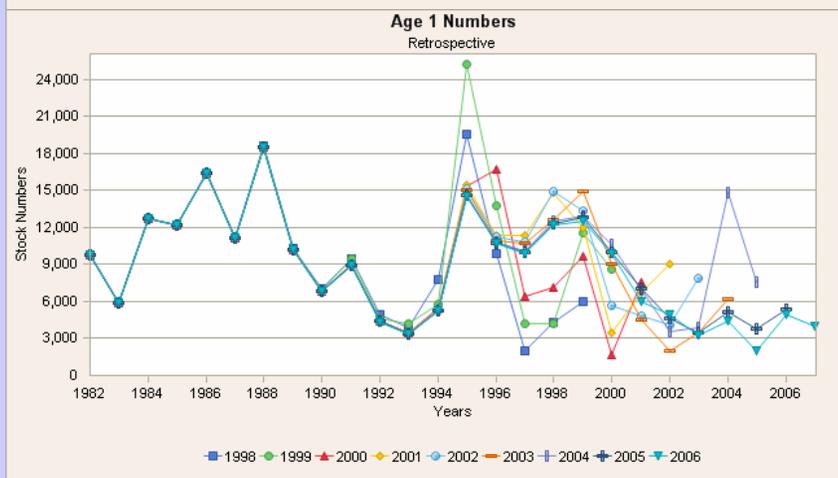
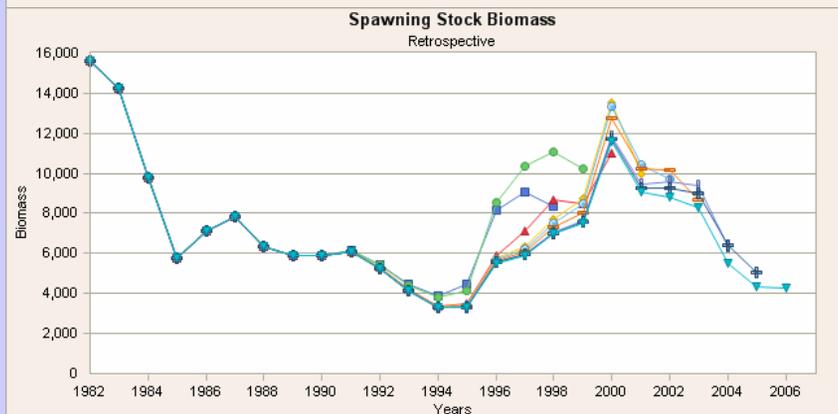
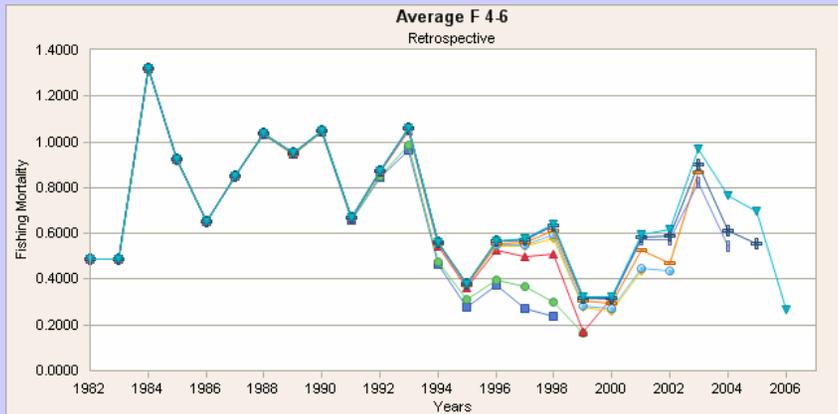
Recruitment

Two rise-and-fall periods

Peak of 18.6 mill. fish (1983-1993)

Peak of 14.6 mill. in 1993, decl. to 2 mill. in 2005, incr. to 4 mill. in 2007



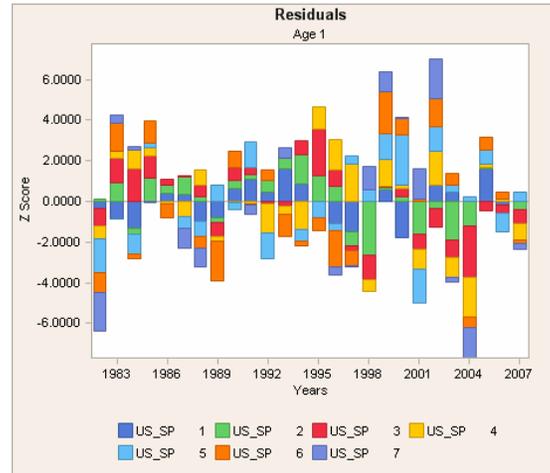


Mild retro. pattern in terminal yr F and SSB, 1993-2006

Underest. of F and overest. of SSB

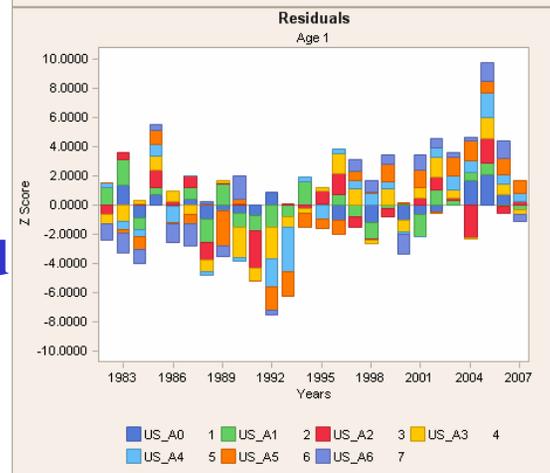
Age 1 recruitment, no retro pattern but highly variable

Omission of ages with residuals patterns resulted in movement of patterns to other ages and worsened retro pattern



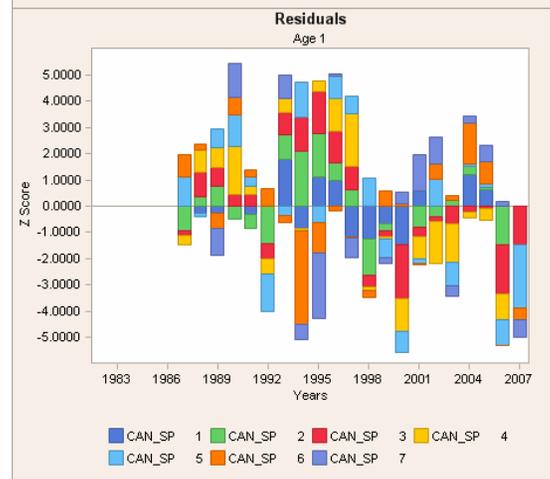
NEFSC spring

Neg. age 3 (red) since 2001



NEFSC fall

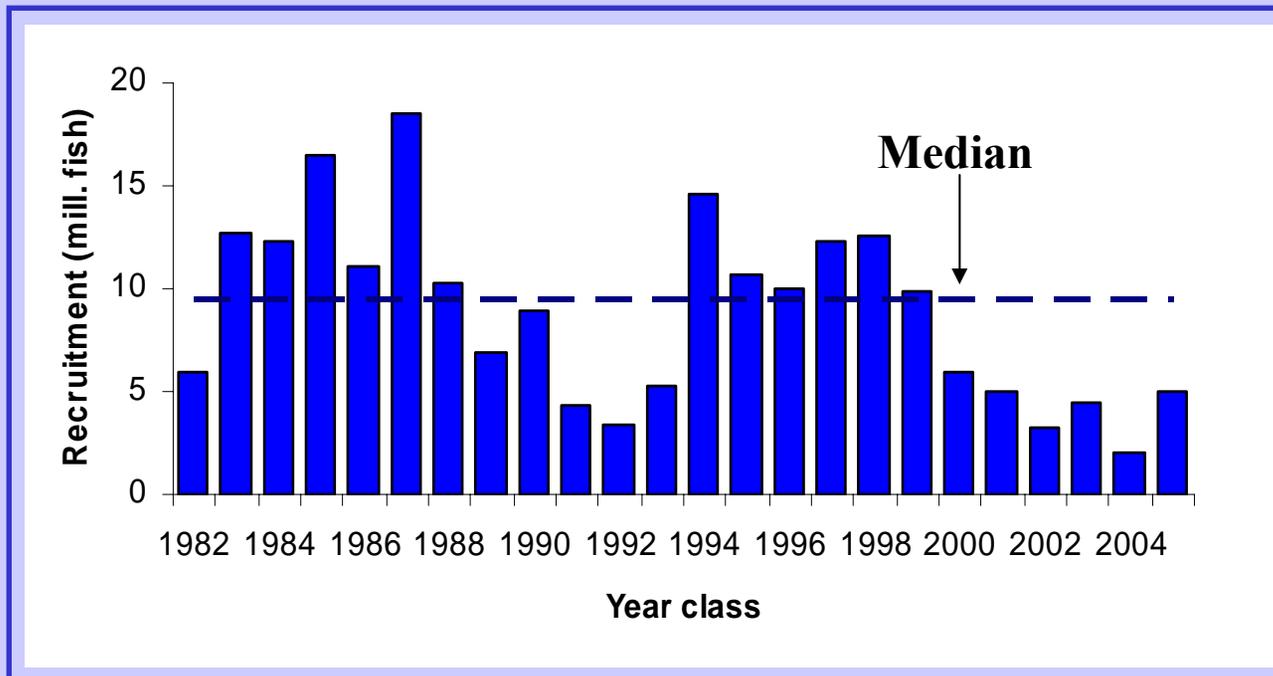
Pos. ages 4 and 5 (lt blue, orange) since 2002



CA spring

Neg. ages 3 and 4 (red, yellow) since 1998

Recruitment

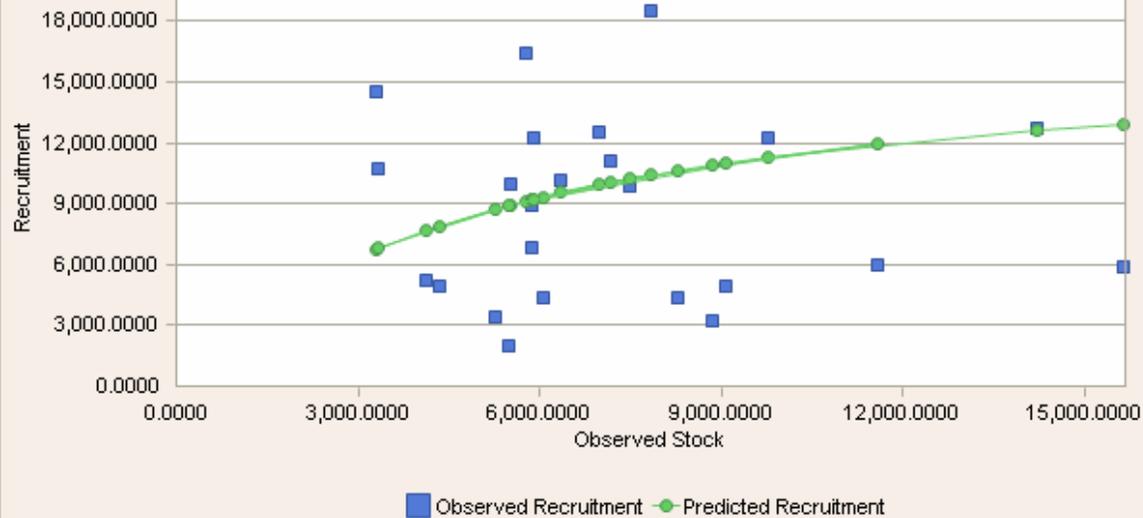


Largest yc in 1987, 1985 and 1994

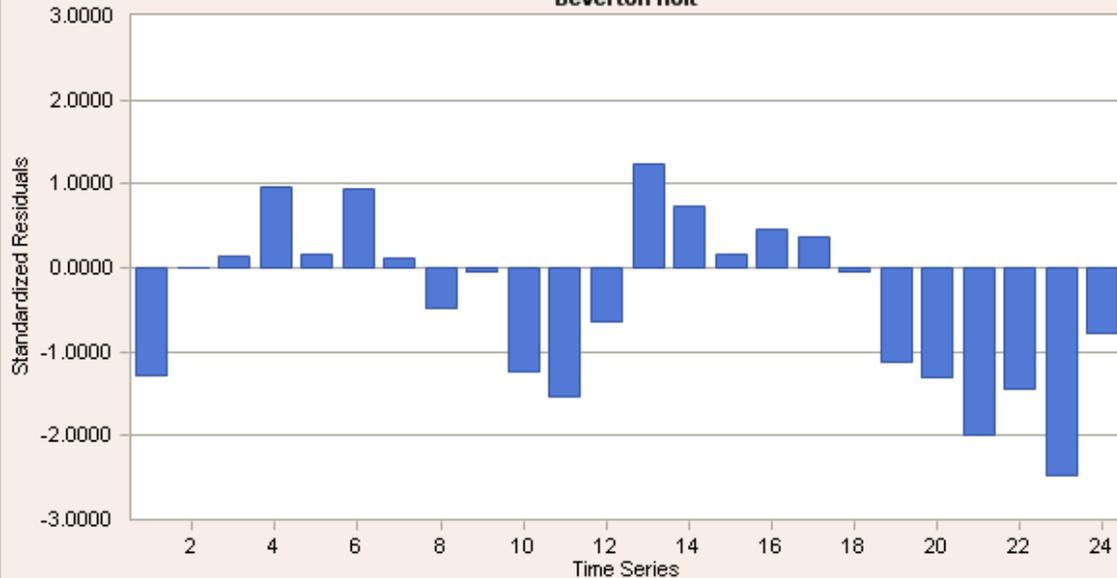
Decline 1998-2004, increase in 2005 yc but low level

Age	PR	Selectivity on M	Stock Weights	Catch weights	Spawning stock weights	Proportion mature
1	0.0005	1	0.061	0.118	0.0607	0.00
2	0.1000	1	0.253	0.444	0.2528	0.44
3	0.4900	1	0.504	0.618	0.5040	1.00
4	1.0000	1	0.737	0.925	0.7367	1.00
5	1.0000	1	1.027	1.186	1.0271	1.00
6	1.0000	1	1.265	1.455	1.2654	1.00
7+	1.0000	1	1.814	1.814	1.8140	1.00

Beverton-Holt S-R relationship



Stock Recruitment Model Prediction
Beverton Holt



1981-2005 yc

Steepness = 1.0
without prior on
unfished R

R_0 prior = 15.98
million fish (= avg. 3
highest R values,
hindcast back to
1963)

Flip-flop
residuals
pattern

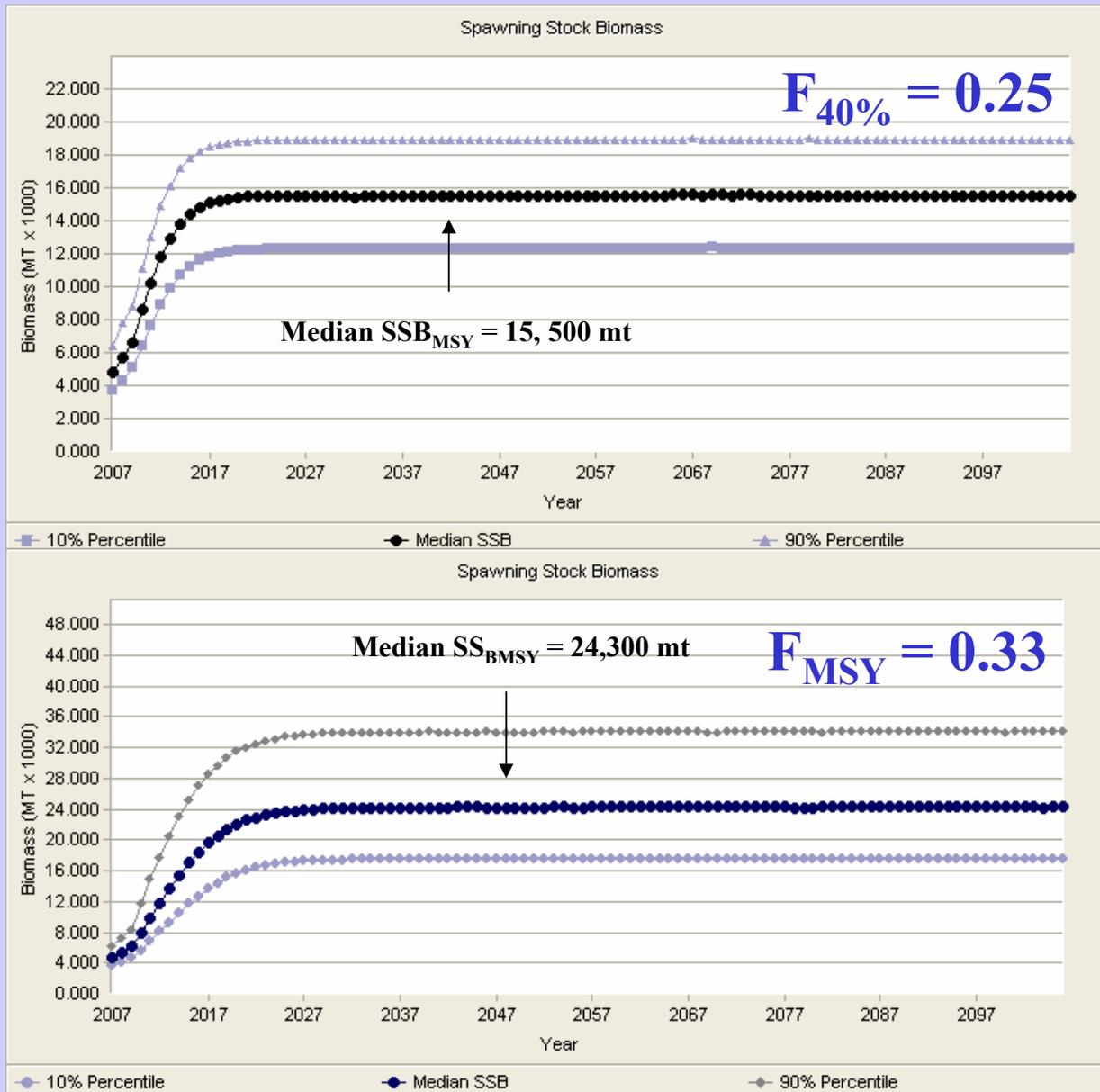
Reference Points

	$F_{40\%}$	F_{MSY}	SSB_{MSY}	MSY	R_0	alpha	beta	sigma
YPR and SSB/R	0.25		15,500	3,500				
Projected	0.25		15,500	3,400				
Beverton-Holt		0.33	20,300	5,700	15.9	17117	5029	0.6129
Projected		0.33	24,300	6,800				
Current¹		F_{MSY}	B_{MSY}	MSY				
		0.32	9,400	3,000				

¹ Source: ASPIC, 1963-2000

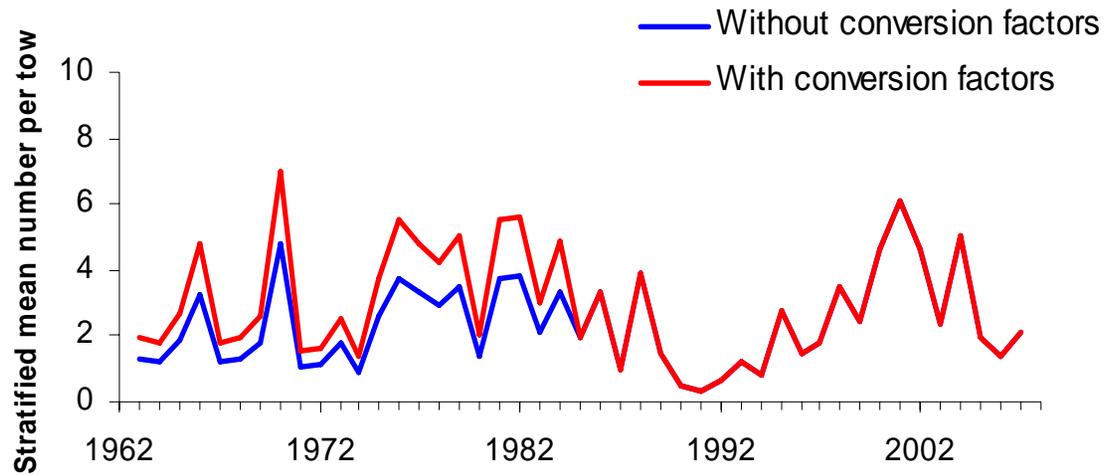
R_0 based on avg of highest 3 yrs of recruitment, including hindcast est., 1963-1981

Projection results, SSB

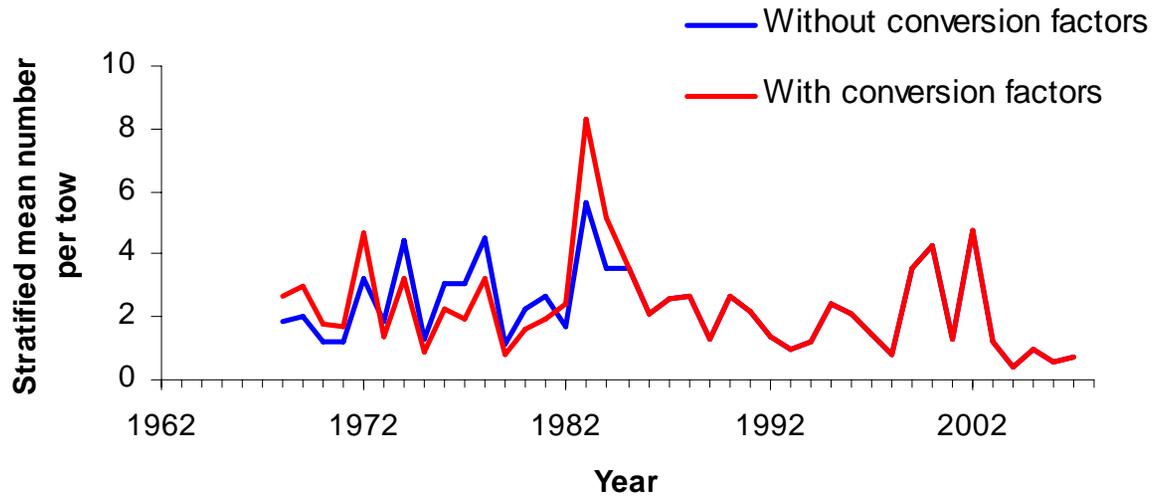


Relative Abundance Indices

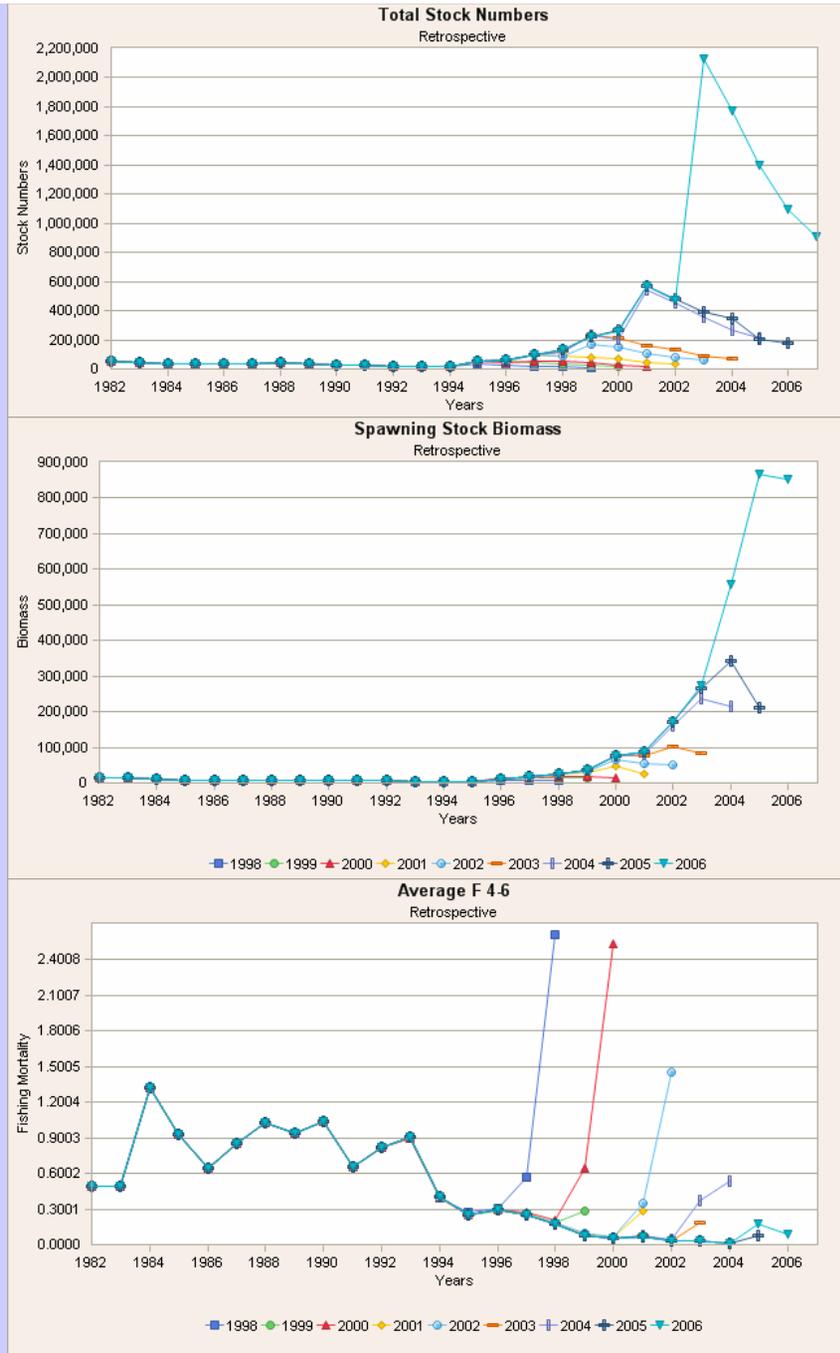
NEFSC fall surveys



NEFSC spring surveys



VPA Retro Split 1982-1994 and 1995-2006



Discards-at-age

1. Bottom trawl

1982-2001

Discard wt. / mean wt. of fish < M.L.S. (= age 1 fish in fall surveys and age 2 fish in spring surveys), estim. for each half of year

2002-2006

Length composition of discards and survey A/L keys and L-W relationships for each half of year

2. Scallop dredge

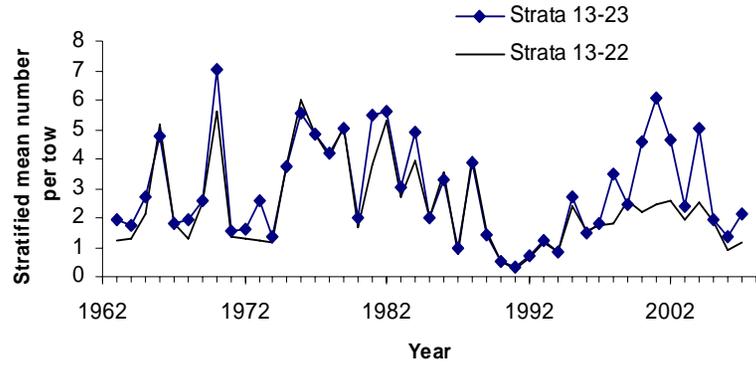
1997, 2004-2006

Discard length comp. and survey data

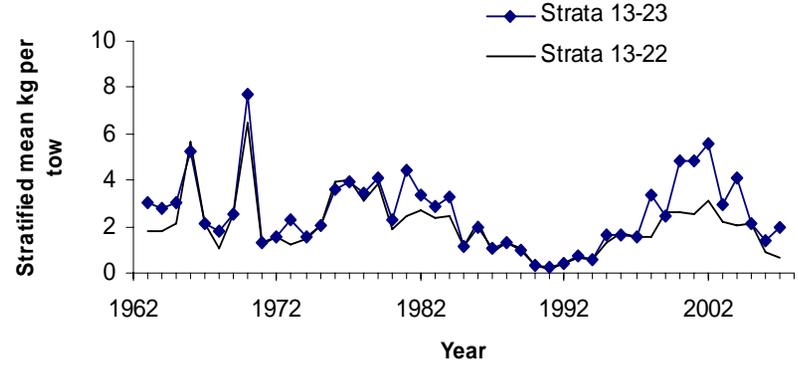
1982-1996, 1998-2003

Discard L-F resembled landings, so scaled up LAA by discards

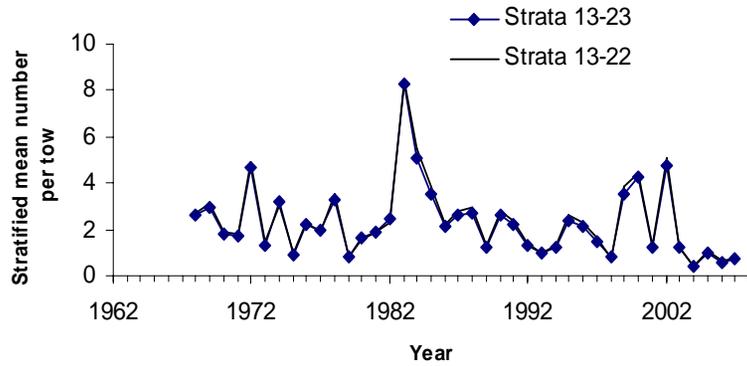
NEFSC fall surveys



NEFSC fall surveys



NEFSC spring surveys



NEFSC spring surveys

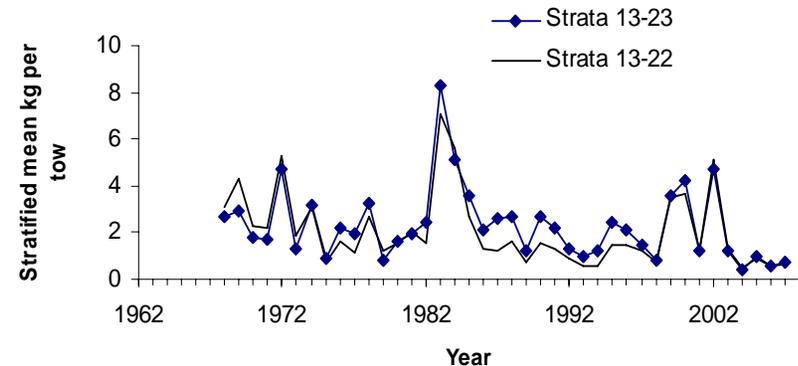
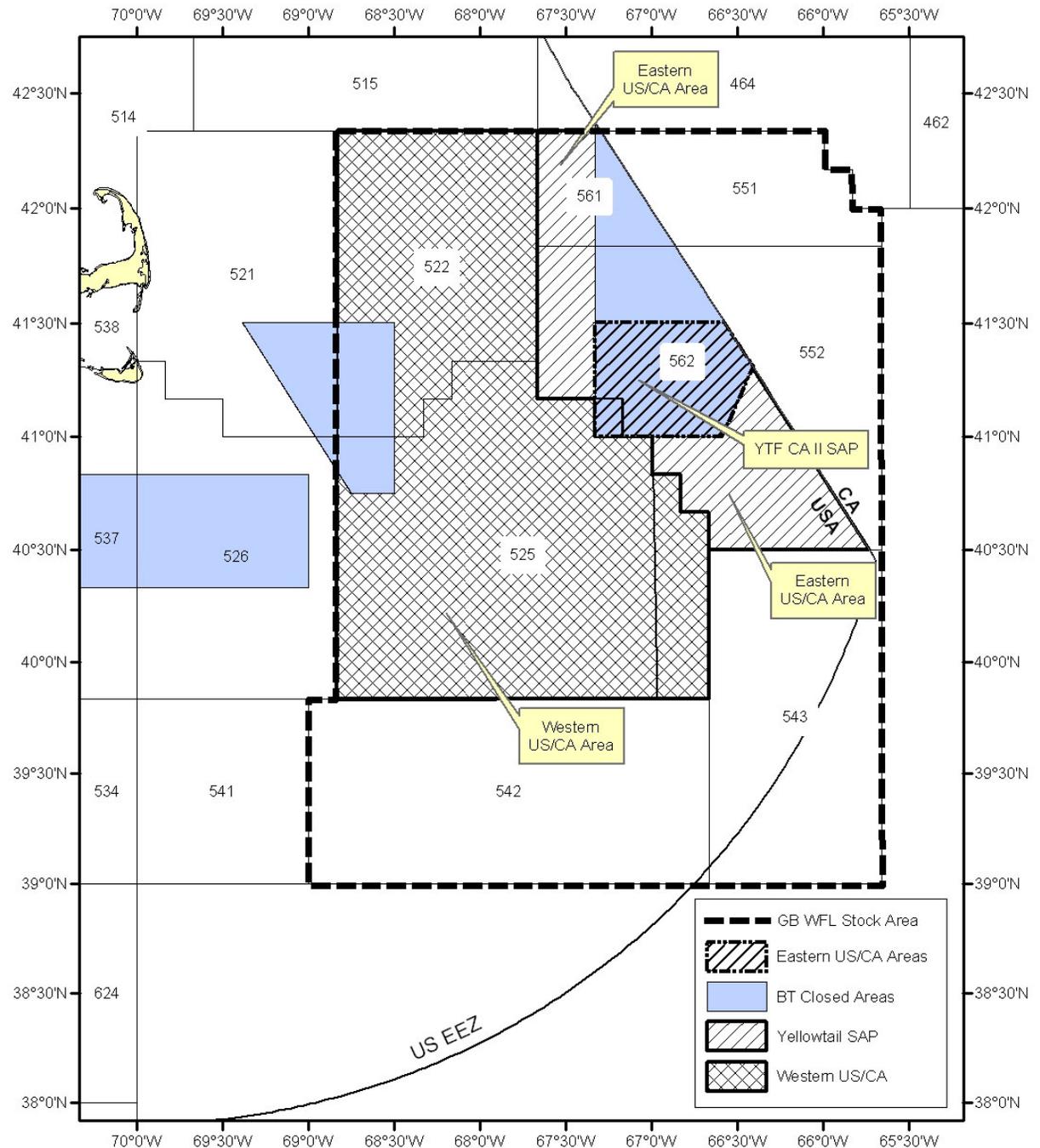


Table K15. Input data, based on 2002-2006 average values from the VPA, for the Georges Bank winter flounder SSB- and yield-per-recruit model ($M = 0.2$).

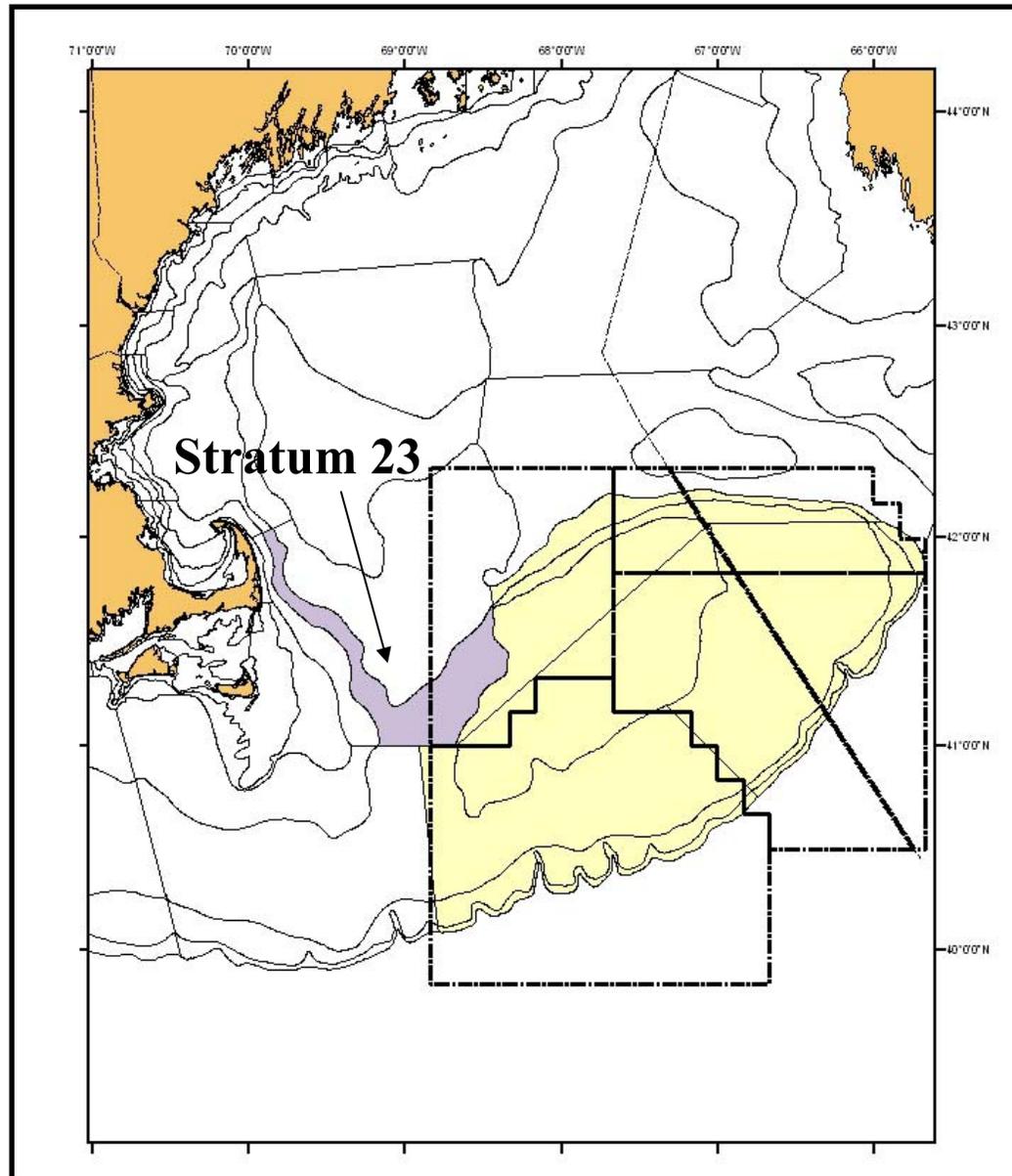
Age	Selectivity on F	Selectivity on M	Mean stock weights	Mean	Spawning	Proportion mature
				catch weights	stock weights	
1	0.0005	1	0.061	0.118	0.0607	0.00
2	0.1000	1	0.253	0.444	0.2528	0.44
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6	1.0000	1	1.265	1.455	1.2654	1.00
7+	1.0000	1	1.814	1.814	1.8140	1.00

Affected by a complex set of regulations that include:

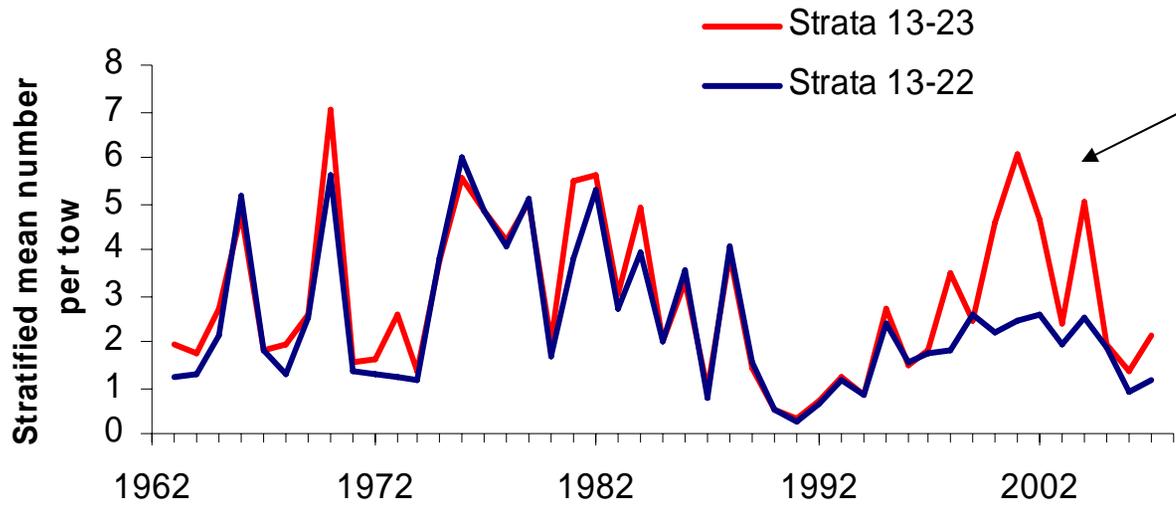
- Areas closed to trawls
- Areas open to scallop dredges
- SAPs requiring gear modifications to reduce groundfish bycatch, effort limitations, and trip limits



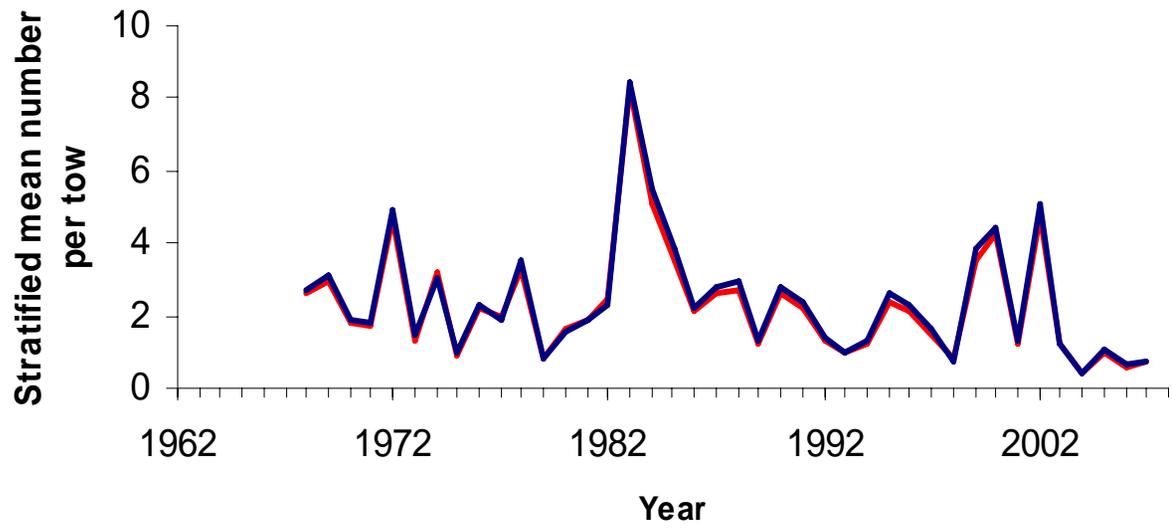
Stratum 23 added to GB WFL strata set (13-22)

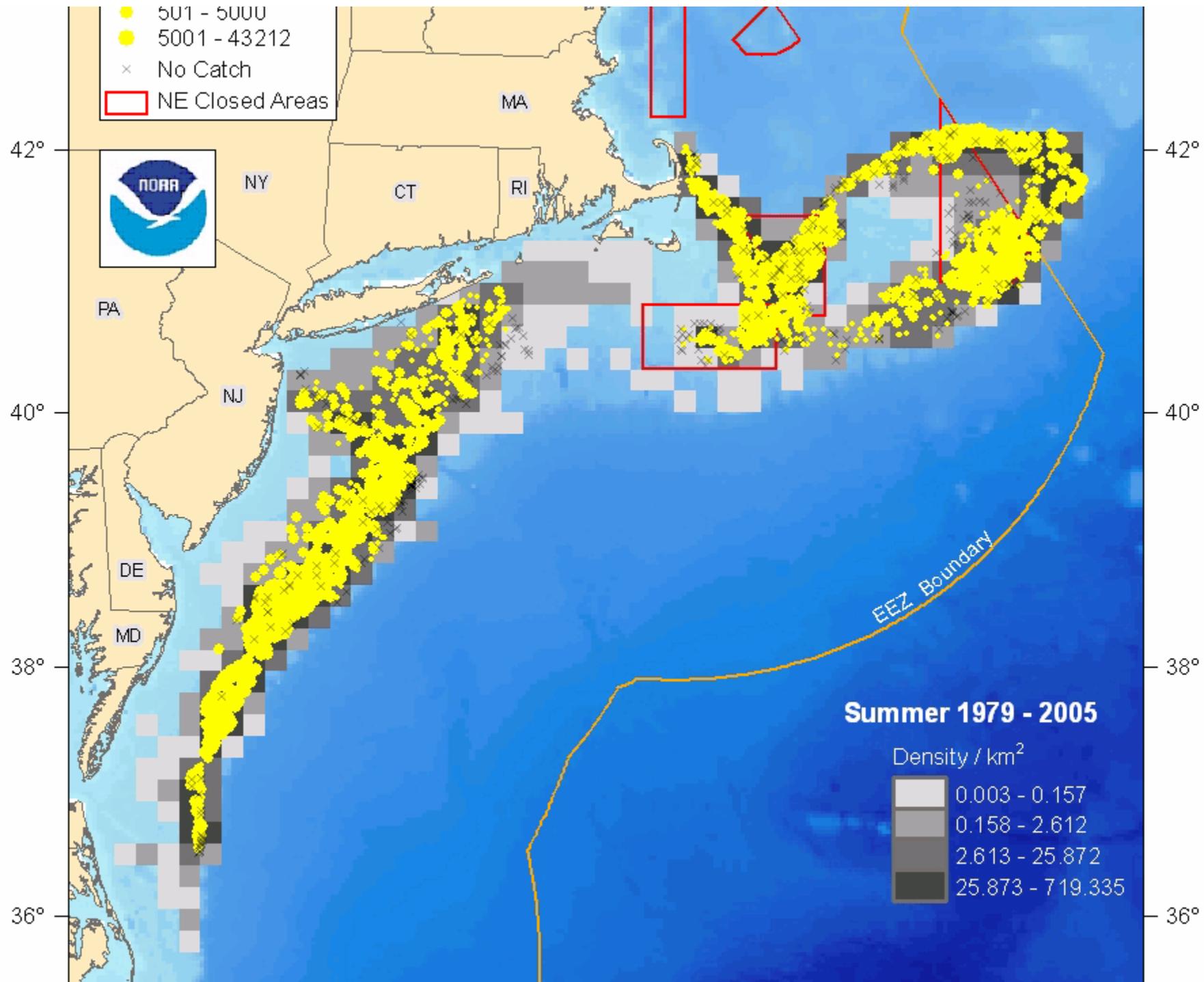


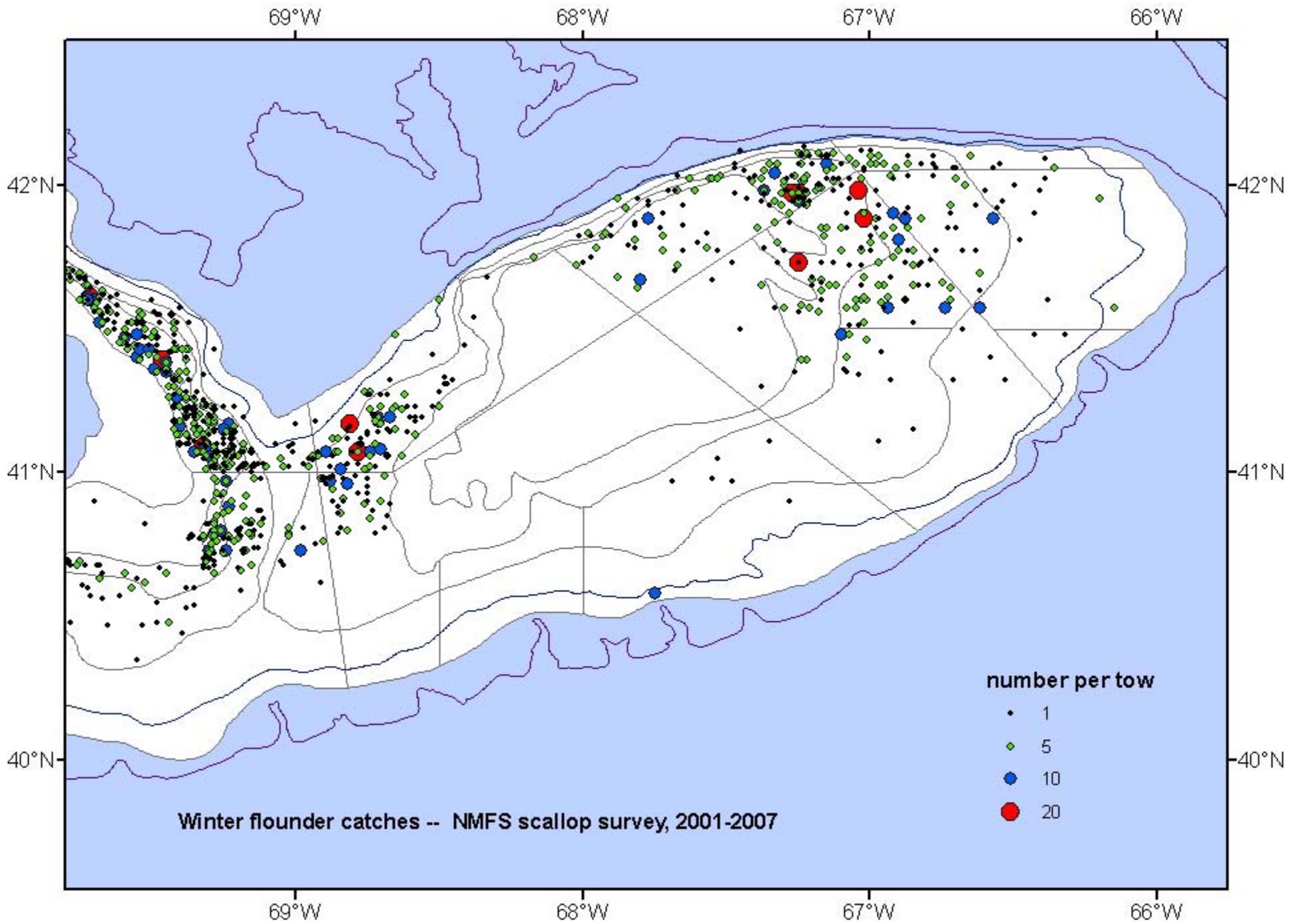
NEFSC fall surveys

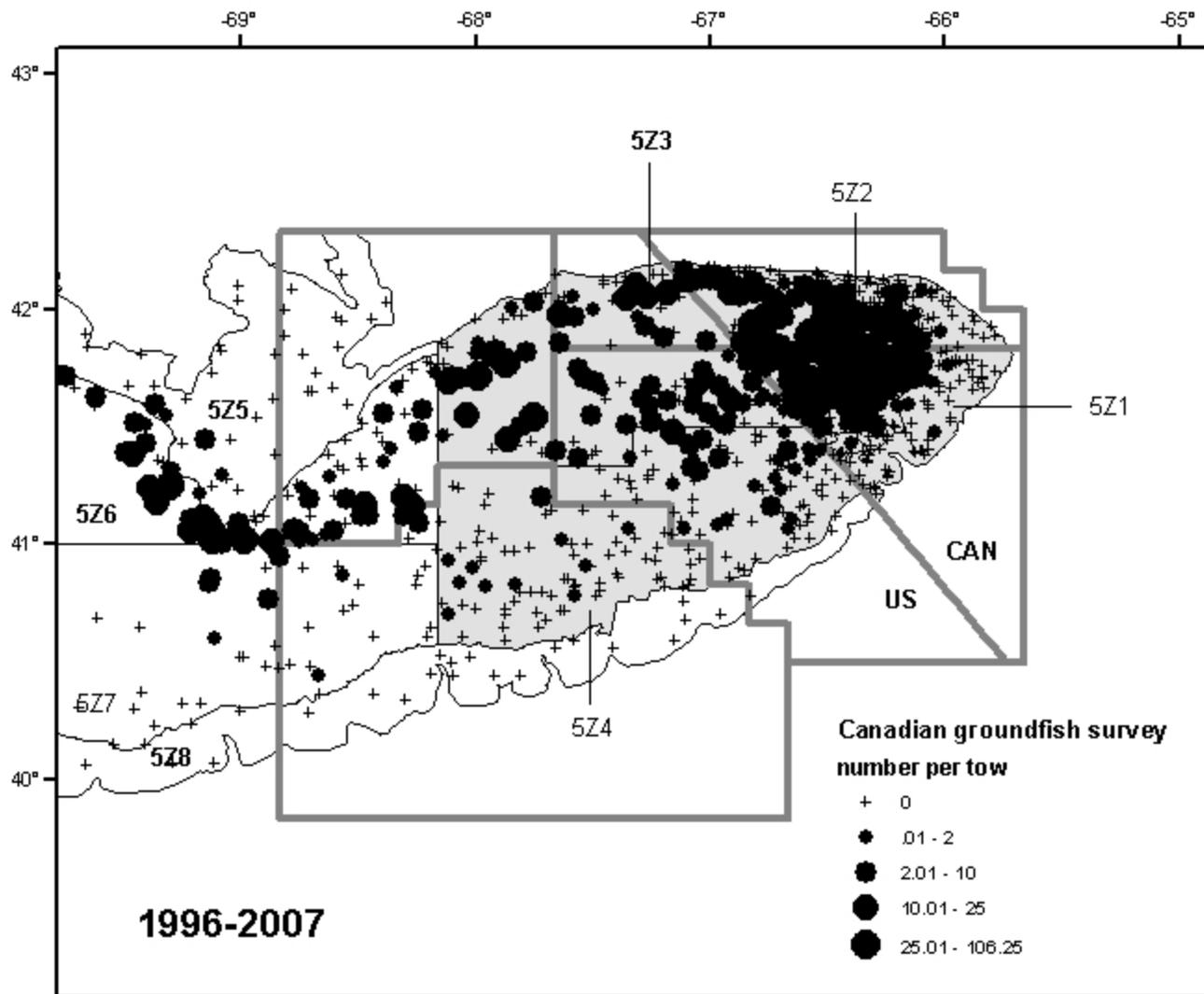


NEFSC spring surveys









CA spring survey